

AMENDMENT and ELECTION  
Appln. No. 09/775,970

PATENT APPLICATION

REMARKS

Reconsideration and further examination of this application is hereby requested. Claims 4-12 are currently pending in the application. Claims 1-3 and 13-25 have been canceled without prejudice to being re-filed in divisional applications.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

**A. ELECTION**

Applicant hereby elects Species A. Applicant respectfully submits that claims 4-12 are directed to Species A. This election is made without traverse.

Claims 2, 13-16, 20, 23, and 25 are directed to Species B (as illustrated in Fig. 6), and claims 3, 21, and 24 are directed to Species C (as illustrated in Fig. 7), with claims 1, 19, and 22 being sub-generic to both of Species B and C. To advance prosecution of the elected Species A, these claims have been canceled in this application.

**B. AMENDMENTS TO THE SPECIFICATION**

The written descriptions of Figs. 6 and 7 were inadvertently switched so that the text citing Fig. 6 actually describes what

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is shown in Fig. 7, and the text citing Fig. 7 actually describes what is shown in Fig. 6. The present amendment corrects this mistake and harmonizes the written description with the drawings.

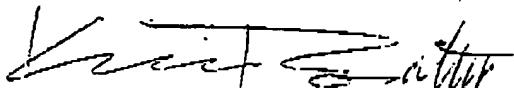
No new matter has been added.

C. CLOSING

An early examination on the merits is respectfully requested.

The Director of the United States Patent and Trademark Office is authorized to charge any necessary fees, and conversely, deposit any credit balance, to Deposit Account No. 18-1579.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE  
IN THE SPECIFICATION:

Amend numbered paragraphs 35, 36, and 82-93 as follows:

35. Fig. 6 illustrates a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention, with an enhanced gap width implemented via a hybrid glass air plus LC gap.

36. Fig. 7 illustrates a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention, with an enhanced gap width implemented via a hybrid air glass plus LC gap.

82. Referring to Fig. 6 7, a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention is illustrated, with an enhanced gap width implemented via a hybrid gap of glass and liquid crystal. A first etalon substrate 602 702 and a second etalon substrate 604 704 are spaced apart from one another. The etalon substrates 602 702, 604 704 are preferably formed of fused silica. Low phase shift dielectric reflector layers 610 710, 608 708 are coated onto each of respective opposed faces of the etalon substrates 602 702, 604 704.

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83. A spacer plate 618 718 is disposed between the first and second etalon substrates 602 702, 604 704. Precision-dimensioned spacer beads 622 722, 624 724 define the spacing between the first etalon substrate 602 702 and the spacer plate 618 718. The spacer plate 618 718 is preferably formed of fused silica, as are the spacer beads 622 722, 624 724.

84. A first transparent conductor layer 606 706 is also coated onto the first substrate 602 702, and a second transparent conductor layer 612 712 is coated onto the face of the spacer plate 618 718 facing the first substrate 602 702. The transparent conductor layers 606 706, 612 712 are preferably formed of Indium Tin Oxide (ITO). A preferred proportion of components in the ITO is 4% Tin to 96% Indium Oxide.

85. The top coating layers on the first etalon substrate 602 702, and on the spacer plate 618 718 are liquid crystal alignment layers 614 714, 616 716. The alignment layers 614 714, 616 716 are formed of polyimide (preferably SE7492 polyimide). After coating, the polyimide alignment layers 614 714, 616 716 are each buffed to provide alignment functionality. A liquid crystal material 630 730 is filled in between the first etalon substrate 602 702 and the spacer plate 618 718. E-44 liquid crystal is preferred.

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86. In the implementation illustrated by Fig. 6 7, the overall gap between the etalon substrate glass plates 602 702, 604 704 is augmented by inclusion of the high precision spacer plate 618 718. This gap augmentation permits higher spectral resolution measurements than is possible in a cell limited in gap width by the practical limit of liquid crystal (LC) thickness. Without the gap augmentation innovation, the largest gap thickness is approximately 100 microns. When this feature of the present invention is utilized it has been possible to manufacture gaps as large as 10 mm. Furthermore, larger gaps are possible. Fig. 6 illustrates an innovative aspect of the present invention wherein a precision glass spacer plate 618 718 is laminated to one of the etalon substrates 604 704, preferably using Norland NOA-68 UV adhesive. The reflector 608 708 coating remains beneath that lamination. The side of the spacer plate facing the LC includes the Indium Tin Oxide (ITO) layer 612 712 followed by a polyamide layer 616 716.

87. Referring to Fig. 7 6, a cross sectional view of a single liquid crystal-filled Fabry-Perot etalon according to the third embodiment of the present invention is illustrated, with an enhanced gap width implemented via a hybrid gap of air and liquid crystal. A first etalon substrate 702 602 and a second etalon

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substrate 704 604

substrates 702 602, 704 604 are spaced apart from one another. The etalon substrates 702 602, 704 604 are preferably formed of fused silica. Low phase shift dielectric reflector layers 710 610, 708 608 are coated onto each of respective opposed faces of the etalon substrates 702 602, 704 604.

88. A spacer plate 718 618 is disposed between the first and second etalon substrates 702 602, 704 604. Precision-dimensioned spacer beads 722 622, 724 624 define the spacing between the first etalon substrate 702 602 and the spacer plate 718 618. The spacer plate 718 618 is preferably formed of fused silica, as are the spacer beads 722 622, 724 624.

29. Precision spacer posts 742 642, 744 644 define spacing dimension between the first and second etalon substrates 702 602, 704 604. The spacer posts 742 642, 744 644 are preferably formed of fused silica, are matched to 1/4 wavelength in height, and are flat to 1/10 wavelength. The spacer plate 718 618 is notched to provide clearance for the spacer posts 742 642, 744 644.

90. A first transparent conductor layer 706 606 is also coated onto the first substrate 702 602, and a second transparent conductor layer 712 612 is coated onto the face of the spacer plate 718 618 facing the first substrate 702 602. The

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transparent conductor layers 706 606, 712 612 are preferably formed of Indium Tin Oxide (ITO). A preferred proportion of components in the ITO is 4% Tin to 96% Indium Oxide.

91. The top coating layers on the first etalon substrate 702 602, and on the spacer plate 718 618 are liquid crystal alignment layers 714 614, 716 616. The alignment layers 714 614, 716 616 are formed of polyimide (preferably SE7492 polyimide). After coating, the polyimide alignment layers 714 614, 716 616 are each buffed to provide alignment functionality.

92. A liquid crystal material 730 630 is filled in between the first etalon substrate 702 602 and the spacer plate 718 618. E-44 liquid crystal is preferred. Thus, the LC cell is bounded by a notched (to accommodate the spacer posts) spacer plate and by one substrate. The spacer-plate and substrate on the other side of the LC are preferably held in place as a cell by epoxy.

93. In the implementation illustrated by Fig. 7 6, a method providing particularly large gaps is illustrated. According to this ~~implementation~~ implementation, precision spacer posts separate the substrates. Rather than laminating the spacer plate to one of the etalon substrates, a large air gap G is formed.